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Seong Deok Ahn

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EXAMINER

CHEN, KEATH T

ART UNIT

PAPER NUMBER

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/672,013	<b>Applicant(s)</b> AHN ET AL.	
	<b>Examiner</b> KEATH T. CHEN	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 21 April 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,6 and 8-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,6 and 8-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 April 2009 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>04/09/2009</u> .  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Amendment***

1. Applicants' amendment to the drawing, filed on 04/21/2009, is acknowledged. The claim amendment filed on 04/21/2009, addressing rejection of claims 1, 2, 4, 6, and 8-14 from the non-final office action (01/22/2009) by amending claims 1, 11, and 14 is entered, and will be addressed below.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1, 2, 4, 6, and 8-14 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 1 and 11 recites the limitations of "the transfer gas distributor is formed such that the transfer gas cannot be transmitted therethrough". There is lack of support of this claim limitation in the Specification, Fig. 2 notwithstanding. For example, there is no disclosure that the transfer gas distributor cannot contain a hole or be porous (while

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majority of the gas distribute along inclined plane, according to the Specification, last line on page 9).

Claims 1 and 11 recites the limitations of "with an apex of the outer inclined surface in direct contact to a rear end of a transfer gas transfer line" and "the transfer gas transfer line ... form a direct contact with the apex of the outer inclined surface of the transfer gas distributor". There is lack of support of this limitation in the claim. Specification merely stated "apex is aligned with the transfer gas inlet", page 5, lines 4-5. There is no discussion demarking the criticality of "connection" for the invention to function. Fig. 2 is a side view of the apparatus, does not support that these components are "in direct contact".

Claim 11 recites the limitation of "the transfer gas inlet ... formed at a circumference of the rear end ..." There is lack of support of this limitation. As the "a rear end" has been defined in claim 1 as connection to the apex of the transfer gas distribution, that is, the surface pointing downward in Fig. 3. This downward surface is a circumference of the transfer gas line. The transfer gas inlet #418 is not formed on this downward surface.

3. Claim 14 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "a plurality of hours" in claim 14 is unclear as previous term "several hours". Specifically, the term include any number of hours, including almost infinity.

Claim 14 will be examined as any number of hours.

***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

**4. Claims 1, 4, 6, 8, and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Randive et al. (US 6789789, hereafter '789), in view of Nishikawa (US 6277201, hereafter '201).**

'789 teaches some limitations of:

Claim 1: An apparatus (Fig. 1) using vapor phase deposition comprising: a deposition part (fig. 1), which comprises: a process chamber (reactor #12); a substrate holder, installed in the process chamber (CVD processing chamber intrinsically has a substrate holder for processing substrate, col. 3, lines 54-67) for supporting a loaded substrate (#16); and a shower head (injector plate/diffuser #32, col. 4, lines 8-9) installed opposite the substrate holder in the process chamber to uniformly distribute organic source vapors (col. 4, lines 14-15, however, "organic" is intended use) to be used for a deposition reaction onto the substrate (col. 4, lines 7-12); and a source part (vaporizer #30), which comprises: a source chamber (vaporizer body #60, Fig. 4) for generating organic source vapors to be supplied to the shower head (as shown in Fig. 1); a transfer gas supply source (#26, carrier gas, col. 4, line 2) for supplying transfer gas that is used to transfer organic source vapors to the process chamber (as shown in Fig. 1); a source heater (heating elements not shown, col. 4, lines 43-45) which surrounds the source chamber and allows organic materials to evaporate to be organic source vapors in the source chamber (col. 5, lines 3-7); a transfer gas distributor (splash

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cone #86, Fig. 4, col. 5, line 47) installed in the source chamber (#60), wherein the transfer gas distributor is a conic block or a conic plate having an outer inclined surface facing an inner surface of the source chamber (as shown in Fig. 4), with an apex of the outer inclined surface in direct contact with a rear end of a transfer gas transfer line (the transfer line include #44, #74 and gas plenum above #74; the apex of #86 is in direct contact with #74, as shown in Fig. 4), and wherein the transfer gas distributor is formed such that the transfer gas cannot be transmitted therethrough (col. 6, lines 59-61) and the transfer gas is distributed widely along the outer inclined surface of the conic block or the conic plate; a diluted gas supply source (preheated carrier gas #46 and/or #48, col. 4, lines 39-41, Figs. 1 and 4), from which diluted gas is supplied to combine with the transfer gas before the transfer gas enters the process chamber in order to control pressure of the process chamber; and the transfer gas transfer line having an elongated shape (the plenum above #74 is elongated shape) that longitudinally extends (chamber above #74 extends into the vaporizer in a length direction, as the length direction has not been defined relative to the elongated shape) from the transfer gas supply source into the source chamber to form a direct contact with the apex of the outer inclined surface of the transfer gas distributor (as shown in Fig. 4), a circumference of the rear end of the transfer gas transfer line including a transfer gas inlet (#74) which is formed by a first plurality of holes (#74 is porous frit, col. 5, line 22, having a plurality of holes) to allow the transfer gas to enter the source chamber for distribution by the transfer gas distributor; and an organic source vapor transfer line (#80, see Fig. 1) extended from inside the source chamber (see Fig. 4) to the shower head, a front end of the organic

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source vapor transfer line extended into the source chamber and including an organic source vapor outlet (#78, col. 5, line 41 and posts #88, col. 5, line 51, Fig. 4), the organic source vapor outlet formed by a second plurality of holes (gaps #90 between the posts #88, col. 5, line 52), the second plurality of holes to allow the organic source vapors distributed by the transfer gas distributor to exit the source chamber.

Claim 11: A method using organic vapor phase deposition comprising:  
generating first organic source vapors by heating a source chamber (vaporizer #60, Fig. 4) containing a first organic source material (from #24, col. 4, line 1); delivering a transfer gas, which is supplied from a transfer gas supply source (#26, carrier gas, col. 4, line 2), into the source chamber via a transfer gas inlet (#74) of a transfer gas transfer line (the transfer line include #44, #74 and gas plenum above #74), wherein the transfer gas(#26) is distributed to the source chamber by a transfer gas distributor (splash cone #86, Fig. 4, col. 5, line 47) installed in the source chamber (#60), wherein the transfer gas distributor is a conic block or a conic plate having an outer inclined surface facing an inner surface of the source chamber (as shown in Fig. 4), with an apex of the outer inclined surface in direct contact with a rear end of the transfer gas transfer line (as shown in Fig. 4), and wherein the transfer gas distributor is formed such that the transfer gas cannot be transmitted therethrough (col. 6, lines 59-61) and the transfer gas is distributed widely along the outer inclined surface of the conic block or the conic plate the transfer gas; transferring the first organic source vapors (#24) by the transfer gas (#26 carries #24), via an organic source vapor transfer line (#80), from the source chamber to a shower head of a process chamber (as shown in Fig. 1); combining

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diluted gas (from #36 or #38) with the transfer gas (#24 plus #26) before the transfer gas enters the process chamber in order to control pressure of the process chamber; causing a deposition reaction by distributing the first organic source vapors transferred via the shower head onto a substrate (col. 4, lines 9-12) that is loaded at a position opposite the shower head; wherein the transfer gas enters the source chamber through the transfer gas inlet (#74), the transfer gas inlet including a first plurality of holes (#74 is porous frit, col. 5, line 22, having a plurality of holes, including circumference of the inlet #74) formed at a circumference of the rear end of the transfer gas transfer line, the transfer gas transfer line having an elongated shape (the plenum above #73 is elongated shape) that longitudinally extends into the source chamber (that does extend into the longitudinal direction) to form a direct contact with the apex of the outer inclined surface of the transfer gas distributor (as shown in Fig. 4), and the transfer gas exits the source chamber through an organic source vapor outlet (#80) formed by a second plurality of holes (gaps #90 between the posts #88, col. 5, line 52) at a front end of the organic source vapor transfer line that extends into the source chamber.

'789 does not explicitly teaches other limitations of:

Claim 1: a substrate temperature controller installed in the substrate holder for controlling the temperature of the substrate.

Claim 11: purging the process chamber after the vapor deposition is completed.



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'201 is an analogous art in the field of CVD with liquid-source vaporization system (field of the invention). '201 teaches a susceptor (#32, Fig. 1, col. 4, lines 15-18) with heater/temperature controller to maintain temperature of the wafer (for claim 1). '201 further teaches to purge the reaction after film formation is completed (col. 6, lines 5-9) (for claim 11).

At the time of the invention was made, it would have been obvious to a person having ordinary skill in the art to have added a heater to the susceptor, as taught by '201, to the apparatus in Fig. 1 of '789; and to purge the process chamber after deposition, for the purpose/motivation of maintain temperature of the wafer, as taught by '201 (col. 4, lines 15-18).

If Applicants argue that the longitudinally extends refers to the elongated shape and '789 teaches the chamber above #74 has length in vertical direction shorter than the width/diameter of the chamber, it is an obvious change of shape without affecting the function of the apparatus of '789. '789 discloses the claimed invention except for shape of the gas transfer line (chamber above #74). It would have been an obvious matter of design choice to change the shape of the chamber above #74, since such a modification would have involved a mere change in the shape of a component. A change of shape is generally recognized as being within the ordinary level of skill in the art. *In re Dailey*, 357 F.2<sup>nd</sup> 669, 149 USPQ 1966.

'789 further teaches the limitations of:

Claim 4: The apparatus of claim 1, wherein the transfer gas distributor (#86) distributes source gas fed from the transfer gas inlet (#74).

Claim 6: The apparatus of claim 1, wherein the source heater is expanded to surround the organic source vapor transfer line (as source vapor transfer line #80 extends from inside the heated source chamber, the heater for the source chamber also heat source vapor transfer, not the claim does not limit heating the entire source vapor transfer line, neither Applicant's heater #500 in Fig. 2 heat the entire line).

The above combination further teaches the limitations of:

Claim 8: The apparatus of claim 1, further comprising a regulator for controlling the flow rate and speed of fluids fed into the process chamber (either the valves of '789, for example metering valve #42; or the valves '201, particularly #38, col. 5, line 60, regulate flow rate).

The apparatus is intrinsically used repeatedly, at least for processing wafer repeatedly. Therefore, '201 further teaches:

Claim 12: The method of claim 11, further comprising sequentially repeating causing a deposition reaction and purging the process chamber (col. 6, lines 5-9).

**5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over '789 and '201, further in view of Nguyen (US 6444039, hereafter '039).**

'789 and '201, together, teach all limitations of claim 1, as discussed above.

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'789 and '201, together, do not teach the limitation of:

Claim 2: The apparatus of claim 1, further comprising a shower curtain, which is installed between the shower head and the substrate holder to surround the substrate holder.

'039 is an analogous art in the field of CVD (col. 1, line 12), particularly in precursor delivery (field of the invention). '039 teaches a baffle guide/shower curtain (#9, Fig. 2, col. 2, lines 10-15) between the shower head (#6) and the substrate holder to surround the substrate holder (#1).

At the time of the invention was made, it would have been obvious to a person having ordinary skill in the art to have added a baffle guide/shower curtain, as taught by '039, to the apparatus in the combination of '789 and '201, for the purpose/motivation to prevent precursor from diffusing too widely, as taught by '201 (col. 2, lines 10-15).

**6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over '789 and '201, further in view of Aoki et al. (US 6439943, hereafter '943).**

'789 and '201, together, teach all limitations of claim 1, as discussed above.

'789 and '201, together, do not explicitly teach the limitation of:

Claim 9: The apparatus of claim 1, comprising a plurality of source chambers for generating different types of organic source vapors and further comprising: a plurality of transfer lines, which are installed to allow different organic vapors to

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sequentially enter the process chamber or bypass using time-division; and  
a plurality of valves, which are installed to use the transfer lines by time-division.

Applicant's claim requirement "to sequentially enter the process chamber" is considered intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (*Walter*, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (*In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02). When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (*In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

'943 is an analogous art in the field of CVD (col. 3, lines 59-61) using vaporizer (col. 6, lines 8-13). '943 teaches two vaporizer (#52 #53, Fig. 5, col. 6, lines 8-13) for used of different compounds and intrinsically having valves to control each line for delivery of precursor.

At the time of the invention was made, it would have been obvious to a person having ordinary skill in the art to have added a plurality of source chamber/vaporizer for

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different compounds, as taught by '943, and adding necessary valves for each lines, to the apparatus in the combination of '789 and '201. The motivation is to carry out the process described in '943.

'789 and '201, together, disclose the claimed invention except for a plurality of source chambers. It would have been an obvious matter of design choice to duplicate the number of source chambers, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8.

**7. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over '789, '201, and '943, further in view of Nguyen (US 5882416, hereafter '416).**

'789, '201, and '943, together, teach all limitations of claim 9, as discussed above.

'789, '201, and '943, together, do not explicitly teach the limitation of:

Claim 10: The apparatus of claim 9, wherein the source heater is expanded to heat the transfer lines and the valves.

'416 is an analogous art in the field of CVD using vaporizer (col. 3, line 29). '416 teaches a thermal jacket (#168, Fig. 1) expanded to heat the transfer lines and the valves (as shown in Fig. 1, col. 10, lines 25-62).

At the time of the invention was made, it would have been obvious to a person having ordinary skill in the art to have added a thermal jacket, as taught by '416, to the apparatus in the combination of '789, '201, and '943 for the purpose/motivation to raise the internal temperature of the conduit/transfer line (obviously to avoid condensation of precursor).

**8. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over '789 and '201, further in view of '943 and Sneh (US 20030180458, hereafter '458).**

'789 and '201, together, teaches all limitations of claim 11, as discussed above. '201 teaches mfurther teaches heat the vaporizer to designate temperature (col. 4, lines 50-52).

'789 and '201, together, does not explicitly teach the limitations of:

Claim 13: The method of claim 11, to form multi-component organic thin films, further comprising: forming second organic source vapors by heating an additional source chamber containing a second organic material; transferring the second organic source vapors via another transfer line, which is maintained at a constant temperature to prevent condensation of the second organic source vapors, to the shower head of the process chamber; causing a second deposition reaction by distributing the second organic source vapors transferred via the shower head onto the substrate that is loaded at a position opposite the shower head; and second-purging the process chamber after the second vapor deposition is conducted on the substrate.

Claim 14: The method of claim 13, wherein the first organic source vapors and the second organic source vapors are alternately supplied to the process chamber using time-division by about 0.01 second to a plurality of hours.

'943 is an analogous art as discussed above. '943 teaches two precursor source chambers.

'458 is an analogous art in the field of ALD using precursor ([0009]). '458 teaches ALD sequence of alternating first reactant, first purge, second reactant and second purge ([0036]) with ~0.6 seconds cycle time ([0013]).

At the time of the invention was made, it would have been obvious to a person having ordinary skill in the art to have adopted the process, as taught by '458 by using the apparatus in the combination of '789, '201, and '943 (claim 9 above) for the purpose/motivation of performing the ALD process taught by '458.

### ***Response to Arguments***

Applicant's arguments filed 04/21/2009 have been fully considered but they are not persuasive.

9. Applicants' amendment of the drawing overcomes the drawing objection.
10. In regarding to 35 USC 112 first paragraph rejection, Applicants' argument is Fig. 2 described the claim limitations, see the bottom of page 6 to the top of page 7.

This argument is found not persuasive.

Fig. 2 does not show any indication of the material being entirely impervious to gases, nor does it show a direct connection from a side view of the apparatus, as discussed in the claim rejection above.

11. In regarding to 35 USC 112 second paragraph rejection, see item B of page 7, Applicants' amendment of claims 1 and 11 overcome the rejection to them. However, the amendment of Claim 14 is still unclear as the scope of the claim, see claim rejection above.

12. In regarding to prior arts, Applicants argue that Randive '789 does not have an elongated shape that longitudinally extends into the source chamber, apex is not in contact with rear end of the transfer gas line, and the pores are not formed at a circumference of the rear end of the transfer gas transfer line, see the first two paragraphs of page 8.

These arguments are not convincing.

The examiner consider the length direction of the "longitudinally" was not specifically tied to the elongated shape. Even if the Applicants argue that it is, it would have been an obvious change of shape without affecting the functionality of the apparatus of '789.

The examiner considers the rear end of the transfer gas line, being in contact with the apex of the transfer gas distributor, is the surface facing downward. Applicants apparently are narrowly interpreting the rear end is the bottom portion of the transfer gas line (a three dimensional object). As the bottom portion can have variable length, this interpretation may have other problems not yet completely analyzed by the



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examiner. One example can be that the transfer gas inlet (#418) formed in the middle of the transfer gas line (#417), which still can be considered as “at rear end”.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEATH T. CHEN whose telephone number is (571)270-1870. The examiner can normally be reached on 6:30AM-3 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/K. T. C./  
Examiner, Art Unit 1792

/Ram N Kackar/

Primary Examiner, Art Unit 1792